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SECTION III.—FORECASTS.

STORMS AND WARNINGS FOR JANUARY.

By H. C. FRANKENFIELD, Professor of Meteorology.

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At the beginning of the month a high-pressure area with a cold wave was passing down the St. Lawrence Valley. There was a low area between the Carolinas and Berniua and another of decided proportions over the Dakotas. There had not been much precipitation over the East during the preceding 24 hours, but in the Northwest and over the section west of the Rocky Mountains there had been quite general rains and snows. The winds were increasing on the north Atlantic coast, and storm warnings were ordered in the morning from Boston to Elizabeth City, N. C. At the same time advices of snow or rain with high southerly winds were sent to open ports on Lake Michigan. Temperatures were high throughout the country, except from the lower Lake region eastward; abnormally so in the Rocky Mountain region and the Northwest. During the 1st pressure also fell on the north Pacific coast, and storm warnings were ordered from Point Lobos, Cal., northward. By the morning of the 2d the northwestern low area had reached the upper Mississippi Valley with an offshoot over Louisiana, and general snows and rains had fallen throughout the central valleys and the upper Lake region. High pressure, low temperature, and high winds continued to the northeastward, while the north Pacific storm was approaching the Washington coast with much increased energy. Over the Plateau region pressure was high. Cautionary advices for snow and colder high winds were again ordered for Lake Michigan ports, and small-craft warnings were ordered along the eastern Gulf of Mexico. During the next 24 hours the upper Mississippi Valley low extended eastward to southern Michigan, while the secondary depression that had been over Louisiana had moved to North Carolina with a great increase in intensity, and general snows and rains had fallen east of the Mississippi River and continued generally, except in the east Gulf and South Atlantic States. Temperatures had fallen considerably over the Gulf States and the Southwest, but were not unusually low. They had also risen decidedly in the Atlantic States. During the afternoon of the 2d storm warnings were ordered on the Gulf coast from Tampa to Pensacola and on the Atlantic coast from Jupiter, Fla., to Charleston, and during the evening and the following morning they were extended along the entire Atlantic coast north of Jupiter, with northeast warnings from Delaware Breakwater to Eastport. In the meantime the Pacific low area had moved to Alberta, and warnings were extended southward to Port Harford, Cal., and continued to the northward, although pressure was rising. There was now a moderate high area over Texas, and warnings were ordered in Louisiana for the frost that occurred on the following morning. Warnings of frost and freezing temperatures were also ordered for South Carolina, Georgia, Alabama, Mississippi, and northern Florida, and warnings of frost for central Florida, and

on the following morning freezing temperatures and frosts occurred as forecast.

On the morning of the 4th the southern section of the storm had reached New Jersey, while the northern one had disappeared, but snows and rains continued north of Tennessee and east of the Mississippi River with strong northeasterly gales on the New England coast, and storm warnings were continued from Baltimore northward. There was an extensive high area over Lake Superior, the Mississippi and Missouri Valleys, and the extreme central West, but without low temperatures in the United States; and another disturbance had reached the north Pacific coast accompanied by southerly gales and rains. Storm warnings had been continued on the 3d north of San Francisco, and they were again continued on the 4th. Cold-wave warnings were also ordered for New England and the northern portion of eastern New York and warnings of freezing temperatures or frost in Alabama, Georgia, South Carolina, and Florida. The frosts and cold wave occurred as forecast, but the latter was delayed until the morning of the 6th, by which time the north Pacific storm had reached northern Lake Superior and another was just crossing British Columbia, while over the central and southern portions of the country pressure was high but still without low temperatures. There had been no precipitation of consequence except in the north Pacific States. Winds on the Atlantic coast had subsided, and warnings were finally lowered on the New England coast. They were, however, continued on the north Pacific coast, as another low-pressure area covered that locality. It should have been remarked that considerable snow had fallen over the central Rocky Mountain region, and a high-pressure area that formed over western Colorado during the 2d persisted with minor fluctuations and with low temperatures until the 15th, when low pressure from the West took its place. By the morning of the 7th the Lake Superior low area had reached the Gulf of St. Lawrence, accompanied by light local snows from the Lake region eastward.

The British Columbia low had reached Winnipeg with increased development but without precipitation, and its place had been taken by another that had moved in from the north Pacific Ocean, and for which storm warnings had already been ordered. Cold weather continued in the South with more heavy frosts in northern Florida and along the Gulf coast. Over the remainder of the country, temperatures were still above the seasonal average.

On the morning of the 8th there had been a general decided fall in pressure throughout the country, except in the Pacific States, with the principal center of depression over Iowa, but the weather was without unusual incident except that there were more frosts in Florida and along the Gulf coast for which warnings had been ordered on the previous day. On the morning of the 9th the Iowa low had moved to southeastern Michigan with increased intensity, and pressure was low everywhere, except in the Pacific States. Small-craft warnings were ordered on the east Gulf coast, also from Charleston to Norfolk,

and advisory messages of strong winds with snow and cold weather were sent to open ports on Lake Michigan. During the afternoon southwest storms warnings were ordered from Sandy Hook to Eastport. By the morning of the 10th the Lake storm had reached the Nova Scotia coast with a great increase in intensity (the barometer at Sydney reading 28.80 inches) and light snows had fallen from the upper Mississippi Valley eastward. There was another disturbance of indifferent character near the mouth of the Rio Grande, another over Saskatchewan, and still another of more important character was approaching the Pacific Northwest, necessitating the hoisting of storm warnings on the north Pacific coast; at the same time warnings were continued on the New England and middle Atlantic coasts. Pressure was rising rapidly in the central West, and during the night cold-wave warnings were ordered for eastern Wisconsin, northeastern Michigan, and northern New England.

On the morning of the 10th warnings of frost and freezing temperatures were again issued for the South Atlantic and Gulf States, including Florida, and also for California and southeastern Arizona. On the morning of the 11th the eastern storm was passing over the Newfoundland coast with a barometer reading of 28.42 inches at St. Johns, and a moderate cold wave covered the districts from Lake Huron eastward. Low temperatures continued in the South but without much precipitation, and another low area from the Northwest had reached Lake Superior with a considerable increase in intensity. On account of the latter disturbance, and on account of a cold high area then central over northern Saskatchewan, advisory warnings of brisk to high northwest winds with a cold wave were again sent to Lake Michigan ports, and cold-wave warnings were ordered for Minnesota. During the day of the 11th the northwestern high area developed rapidly, and in the afternoon cold-wave warnings were ordered for the upper Lake region, the upper Mississippi Valley generally, South Dakota and northern Nebraska. Warnings were also issued for frost in Florida, and freezing temperatures in South Carolina and Georgia. Small-craft warnings were also ordered in the morning at Key West, and at night southwest storm warnings were ordered on the Atlantic coast from Sandy Hook to Eastport. Storm warnings had also been continued on the north Pacific coast and were extended southward to San Francisco.

On the morning of the 12th a strong high-pressure area covered the Northwest, and pressure was generally high over the upper Lake region, the central valleys, and in the South and the interior West. The Lake Superior disturbance had reached the St. Lawrence Valley with much increased intensity, and general snows had fallen from the Ohio Valley and Lake region northeastward. There had been severe gales on the Lakes and a cold wave covered the entire northern portion of the country east of the Rocky Mountains, except the northeast. Temperatures also fell considerably in the South, with more heavy frosts and freezing temperatures. Storm warnings were then continued southward on the Atlantic coast as far as Norfolk. The north Pacific disturbance had also increased somewhat, and on the evening of the 12th storm warnings were continued from San Francisco northward and extended southward to San Diego. By the following morning (13th) the storm center had passed off the Newfoundland coast and a severe cold wave prevailed from Ontario eastward with temperature readings of 48° below zero at White River, Canada, and 24° below zero at Northfield, Vt. Warnings for the sections of the United States covered by the cold wave had been issued

on the morning of the 12th. Pressure was now high everywhere east of the Rocky Mountains, except in New England, and temperatures were below the seasonal average throughout the eastern half of the country. Pressure was still low on the Pacific coast and storm warnings were continued from Eureka to San Francisco.

By the morning of the 14th there had been a further fall in temperature in the Atlantic States and the line of zero extended to extreme southern New Jersey, while at Canton, N. Y., the thermometer registered 30° below zero. Pressure, however, was falling rapidly in the West and there had been a general and decided rise in temperatures to much above normal conditions. Pressure had also again fallen on the Pacific coast and storm warnings were ordered generally from San Diego northward. A Canadian northwest disturbance of considerable energy had reached Manitoba and advisory messages were sent to Lake Michigan ports. By the evening of January 14 the Manitoba disturbance had reached northern Lake Superior, and southwest storm warnings were ordered from Delaware Breakwater to Boston. However, by the morning of the 15th this disturbance had lost much of its intensity and had moved very little; consequently there were no high winds on the Atlantic coast and storm warnings were ordered down at 10 a. m. Light local snows had continued from the Lake region eastward and there had been a great rise in temperature over practically the entire country, so that in the Northwest and extreme Central West temperatures were 20° to 35° above the seasonal average. The north Pacific storm of the previous day had moved to Saskatchewan and another was approaching the Washington coast, necessitating a continuance of the storm warnings from San Francisco northward. Rains and snows also continued generally west of the Rocky Mountains. By the morning of the 16th the northwestern disturbance had reached Lake Michigan with increased intensity but without precipitation, except snow in the Lake Superior region. The Pacific disturbance continued to increase, rains and snows were still general, and storm warnings were continued generally northward of San Francisco and extended southward to San Diego. Over the interior of the country pressure was comparatively low, but with high temperatures and without precipitation. On the morning of the 17th there was a strong high area over Lake Superior with some quite low temperature readings in Canada. The low area had passed off the southern New England coast and there had been quite general snows from the Lake region and upper Ohio Valley eastward. Snows and rains also continued west of the Rocky Mountains. The barometer continued to fall on the north Pacific coast and the lowest readings thus far in the month were recorded, Roseburg, Oreg., reporting 29.14 inches at 8 a. m.

By the morning of the 18th pressure was low west of the Rocky Mountains and in the Northwest, with the lowest barometer off the Washington coast, and rains and snows had fallen generally west of the mountains. Conditions were also unsettled over the central portion of the country, with some snow, while to the eastward pressure was high with much lower temperatures and with a moderate cold wave over the northeastern districts. On the morning of the 19th there was a depression of indefinite character over Minnesota and Lake Superior without precipitation of consequence and pressure was rising rapidly to the northwestward, the low area off the Washington coast having almost entirely disappeared, although general rains and snows continued west of the mountains. The main disturbance drifted eastward in irregular formation, causing rains and snows from the upper Mississippi Valley and

upper Lake region eastward and some snows in the Northwest. Directly to the northward pressure was rising rapidly with a decided fall in temperature, while to the southward the weather was unsettled and abnormally warm, with falling pressure. Over the extreme Central West pressure was high with seasonable temperatures, but another low was approaching the north Pacific coast and rains and snows were again falling in Idaho, Oregon, and Washington. By the evening of the 20th the Middle West storm had assumed definite character with increased intensity and snows and rains were falling generally from the upper Mississippi Valley and the upper Lake region eastward, while to the southward the weather continued generally fair with abnormally high temperatures. Small craft warnings were ordered for the following day from Norfolk to Boston and southeast storm warnings on the Oregon and northern California coasts. By the morning of the 21st the eastern storm had reached New York and southern New England with still further development, and storm warnings were at once ordered from Eastport, Me., to Hatteras, N. C. The barometer had also continued to fall to the southward and rains and snows had occurred generally over the eastern half of the country. In the Central West the weather was still fair with moderately low temperatures, while west of the Rocky Mountains the barometer continued to fall with general snows and rains over the central and northern districts, and storm warnings were ordered during the day for the remainder of the north Pacific coast and were continued on the north California coast. During the next 24 hours the eastern storm moved off the Newfoundland coast with a still greater increase of energy and the weather had cleared generally throughout the Atlantic and Gulf States with a decided fall in temperature, and with a cold wave in New York and New England.

The north Pacific storm had moved inland and conditions had become very much unsettled west of the Allegheny Mountains with five or six separate centers of depression, and with light snows in the Lake region, the central valleys, and the extreme Northwest. Rains and snows also continued over the northern and middle districts west of the Rocky Mountains with heavy rainfall in many portions of northern California. The rains and snows continued over the extreme West, but the low-pressure conditions drifted eastward so that on the morning of the 23d there was a well-defined disturbance over southwestern Iowa and another over Lake Superior, while in the Atlantic States the weather remained generally fair with low temperatures over the northern districts. On the morning of the 24th unsettled weather prevailed from the Mississippi Valley eastward with general rains and snows and with another decided rise in temperature, while over the Northwest pressure was rising rapidly with a cold wave, the temperatures ranging from 4° to 20° below zero, while in the Canadian Northwest they were as low as 34° below zero. Rains continued in the Pacific States and another decided fall in pressure occurred, the barometer at Roseburg, Oreg., reading 29.24 inches.

As conditions were threatening in the East storm warnings were ordered on the Atlantic coast from Jacksonville to Eastport and during the following 24 hours high winds occurred generally. Similar conditions prevailed in the Pacific districts on the following day and a low area that had been over the Ohio Valley moved rapidly north-eastward to New Brunswick with a decided increase in intensity. As pressure was again falling rapidly throughout the West unsettled weather generally continued throughout the country. Conditions then became more

settled east of the Rocky Mountains although light rains and snows continued in the central valleys and the Lake region, but the Pacific storm continued to increase, and at 8 p. m. of the 25th the reduced barometer at Tatoosh Island, Wash., read 28.60 inches, rising to 28.80 inches by the following morning. Low pressure now prevailed generally except in the Northeast, with a second center of abnormally low pressure over western South Dakota, and conditions were unsettled with rains and snows over all districts except the central Rocky Mountain region and the Southwest. Over much of central and southern California the rainfall was torrential.

On the morning of the 27th high pressure prevailed in the Atlantic States, but was still generally low over the Interior, although with somewhat more settled conditions. There was a depression over Iowa that during the following 24 hours moved northeastward to New Brunswick with decreasing intensity causing some light snows and rains in the lower Lake region and New England, while the Pacific disturbance had moved rapidly to the eastern slope of the Rocky Mountains and high pressure prevailed in the Coast States. Up to this time storm warnings had been displayed continuously on the Pacific coast. The weather remained unsettled but without much precipitation east of the Rocky Mountains except in the northwestern States. Owing to the rapidly falling pressure small craft warnings were ordered on the morning of the 28th for the Gulf coast from Brownsville, Tex., to Carrabelle, Fla. There had also been a decided rise of pressure over British Columbia accompanied by a cold wave and cold wave warnings were ordered for the Northwest and Central West generally. By the morning of the 29th the western disturbance was central over northern Lake Superior with greater intensity, but at the same time a secondary offshoot had moved from southeast Colorado to the mouth of the Rio Grande with an apparent decrease in energy. A rapid rise in pressure and an equally rapid fall in temperature followed this low, and snows and rains occurred from Texas north-eastward through the upper Lake region. Temperatures remained abnormally high throughout the East and South and cold wave warnings were ordered for the Ohio Valley. Pressure had also risen west of the Rocky Mountains, except on the north coast, and temperatures were generally low with frosts in California. As pressure was again falling on the Washington coast, storm warnings were ordered for Washington and Oregon.

By the morning of the 30th the northern disturbance had reached the Gulf of St. Lawrence practically dry. The one that had been over the mouth of the Rio Grande had moved to southeastern Mississippi, while the Pacific storm had moved inland to Saskatchewan attended by snows and rains over the extreme Northwest. In the upper Lake region, the central valleys, and in the extreme West pressure was high with low temperatures as a rule, but in the East and South abnormally high temperatures continued, and snows and rains were falling in the Ohio Valley and the Gulf States. The northern storm passed off the Newfoundland coast by the morning of the 31st and the northwestern one had moved to western Lake Superior without incident, but the southern storm had developed great intensity and had reached north-eastern Ohio, with a barometer reading 29.44 inches at Cleveland. Heavy rains fell over the middle and south Atlantic States and heavy snows and rains in the Ohio Valley, the lower Lake and southern upper Lake regions. In the West the weather was generally clear with high pressure and moderate temperatures except

on the north Pacific coast, where snows and rains were again falling with lower pressure. Owing to the threatening conditions on the night of the 30th cautionary advices were sent to Atlantic coast ports from Baltimore to Boston, and on the morning of the 31st storm warnings were ordered from Hatteras to Eastport, and at the same time warnings of heavy frost and freezing temperatures were sent to the Southern States as far south as northern Florida. On the night of the 31st the disturbance covered Ontario, New York, and southern New England, with general rains and snows and high winds over those sections, but in the interior the weather had cleared except in the upper Lake region and temperatures were falling rapidly but not to any low figures.

NORTHERN HEMISPHERE PRESSURE DISTRIBUTION.

Over Alaska pressure was low throughout the first half of the month, abnormally so during much of the time, while during the second half of the month the reverse condition prevailed except between the 27th and 30th, and there were marked crests between the 20th and 23d.

Over the United States there was the usual progression of low and high areas of fairly uniform character during the first half of the month, but during the second half low pressure predominated without the intervention of any marked high areas, the result being apparent in the abnormally high temperatures that prevailed throughout much of the month. There was quite a severe storm during the last day of the month, but it did not develop materially until that time.

Over the Canadian Maritime Provinces pressure appears to have been abnormally low much of the time. There were, however, quite well-marked crests of high pressure on the 3d and again on the 27th and 29th.

Over the western half of the north Atlantic Ocean pressure was also low during much of the month with a decided fall over the island of Bermuda and over the Azores on the 17th. There was some recovery, however, during the third decade of the month. Over the eastern

portion of the north Atlantic the opposite conditions prevailed and high pressure was general up to the 22d, except between the 4th and the 10th, with maximum pressure on the 13th and 15th, inclusive. After the 22d a period of low pressure set in which was exceedingly well marked over Iceland, especially on the last day of the month, when the barometer at Seydisfiord read 962 millibars, or 28.42 inches.

Over Europe—that is, western Europe—there was considerable high pressure with rather low temperatures, although a decided depression occurred on the 5th and 6th. Over Russia pressure was generally low, frequently abnormally so, with but a single period of marked high pressure from the 11th to the 13th of the month. Low pressure also prevailed to the eastward throughout Siberia without any intermissions of importance.

In the coast districts, including Japan and China, fluctuations were within comparatively narrow limits, except from the 13th to the 15th, when there was a marked depression.

In the north Pacific Ocean conditions were very much similar to those that prevailed over Alaska, that is, low pressure during the first half of the month and generally high during the second half, with marked departures from the normal in both directions. As was to be expected the opposite conditions prevailed over the southern portion of the north Pacific as indicated by the reports from Honolulu, where moderately low pressure during the first five days of the month was succeeded by a period of high pressure which lasted until the 17th, with a strong crest on the 15th. Afterwards there were four or five days of nearly normal pressure followed by a period of high pressure that prevailed until the last day of the month. Opposite conditions prevailed over the north section at the same time, but not to such a marked extent as during the first half of the month.

Beginning with the 30th day of the month reports from Spitzbergen were added to the International Weather Chart, which began publication on January 1, 1914.